

PIER Climate Change Research Strategy

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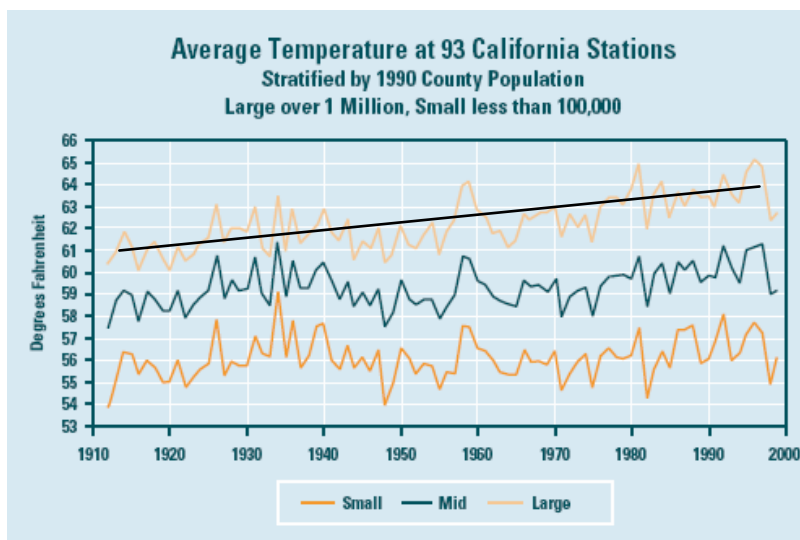
Lawrence Berkeley National Laboratory

Outline

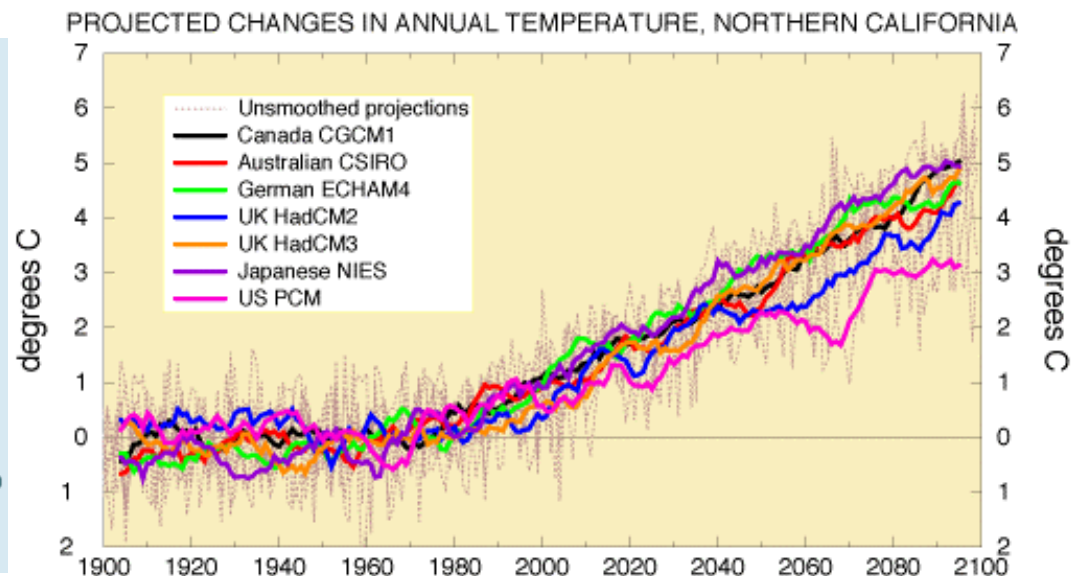
- ★ Example of Potential Major Climatic Changes in California
- ★ PIER Climate Change Research Plan
- ★ California Climate Change (Research) Center
- ★ General Strategy
- ★ PIER Research Path: an example
- ★ Economics and Integration

Potential Major Changes in California

Ambient Temperatures



Source: EPIC Report



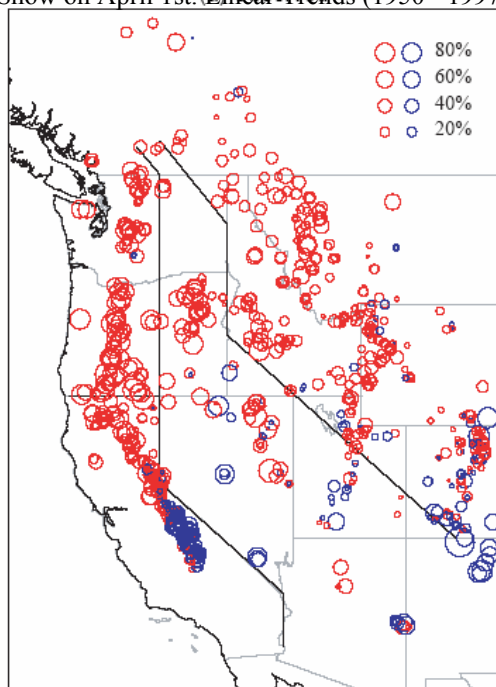
Source: Scripps

Potential Major Changes in California

Amount of Snow on April 1st

There is an Alarming Decreasing Trend in the Amount of Water Available

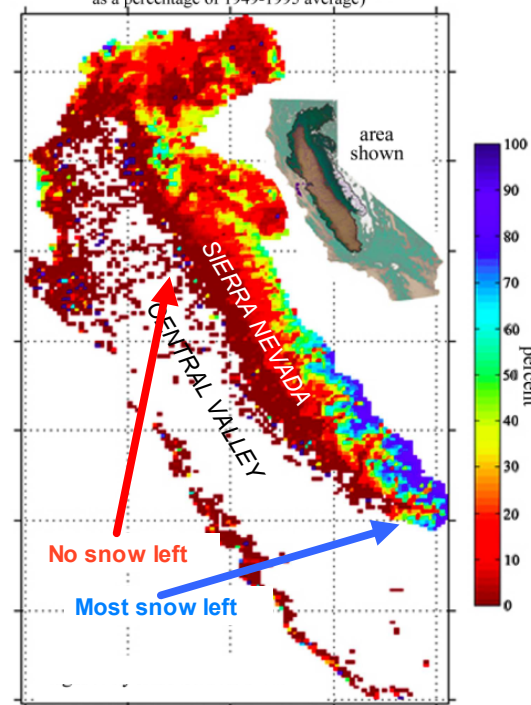
as Snow on April 1st. Linear Trends (1950 - 1997)



Red = decreasing trend

Source: Mote et al. 2004

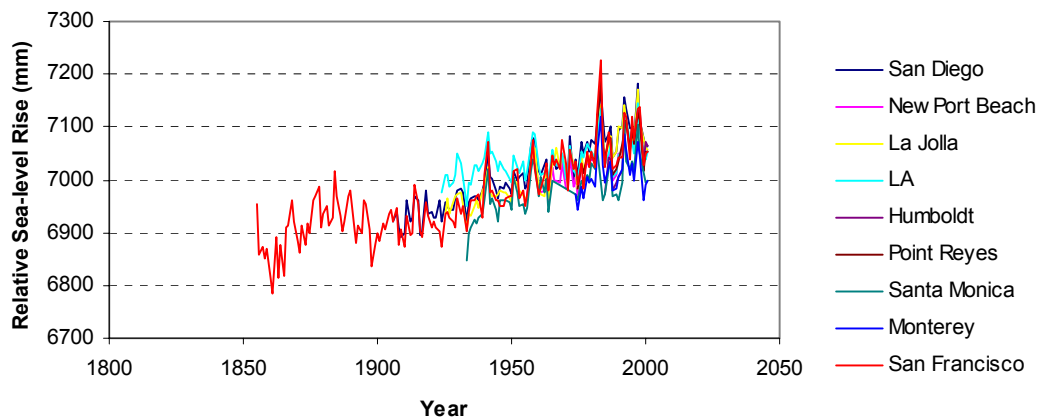
Snowpack Changes
(average 2050-2069 liquid water equivalent
as a percentage of 1949-1995 average)



Source: Knowles et al. 2003

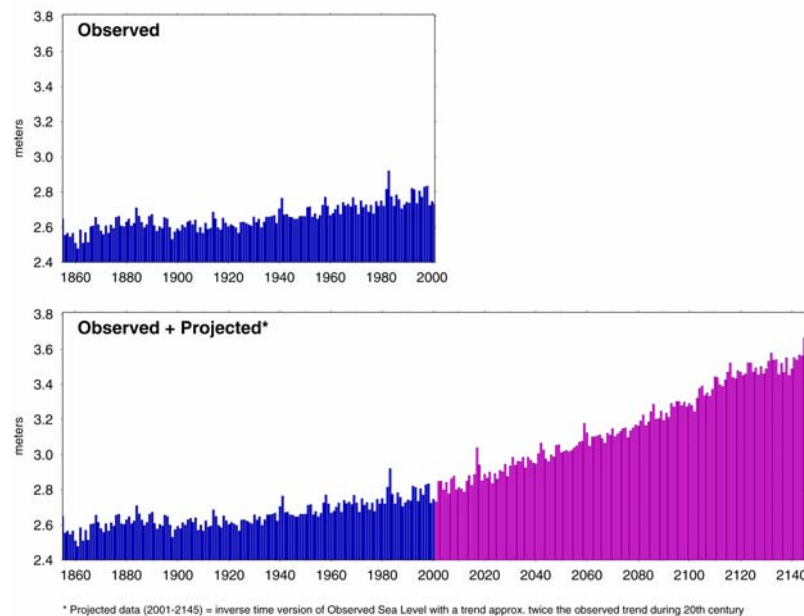
Potential Major Changes in California

Sea Level Rise



Data Source: Permanent Service for Mean Sea Level,
hosted by the Proudman Oceanographic Laboratory

San Francisco Mean Sea Level: Past, Present and Future?

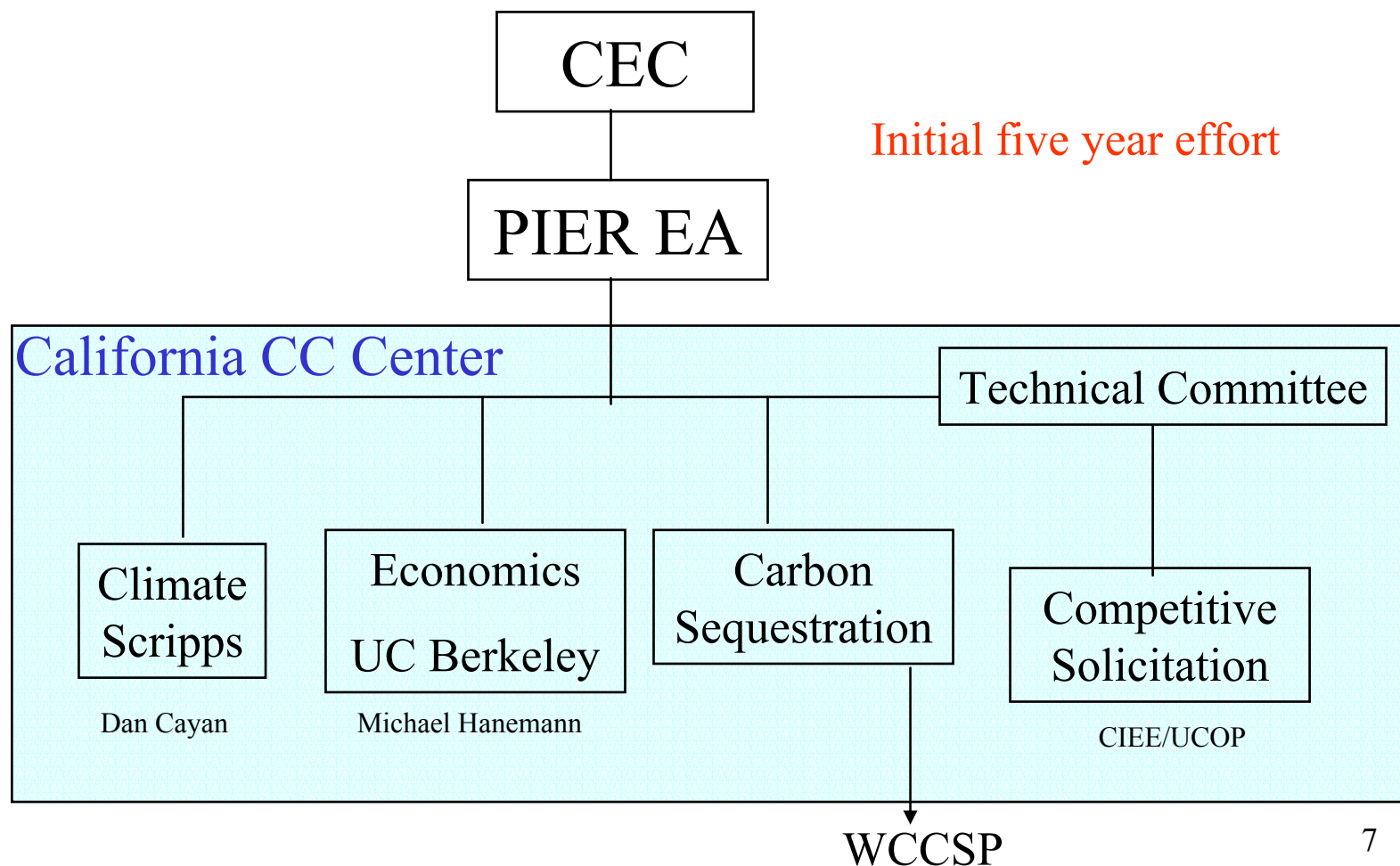


Source: Knowles et al. 2003

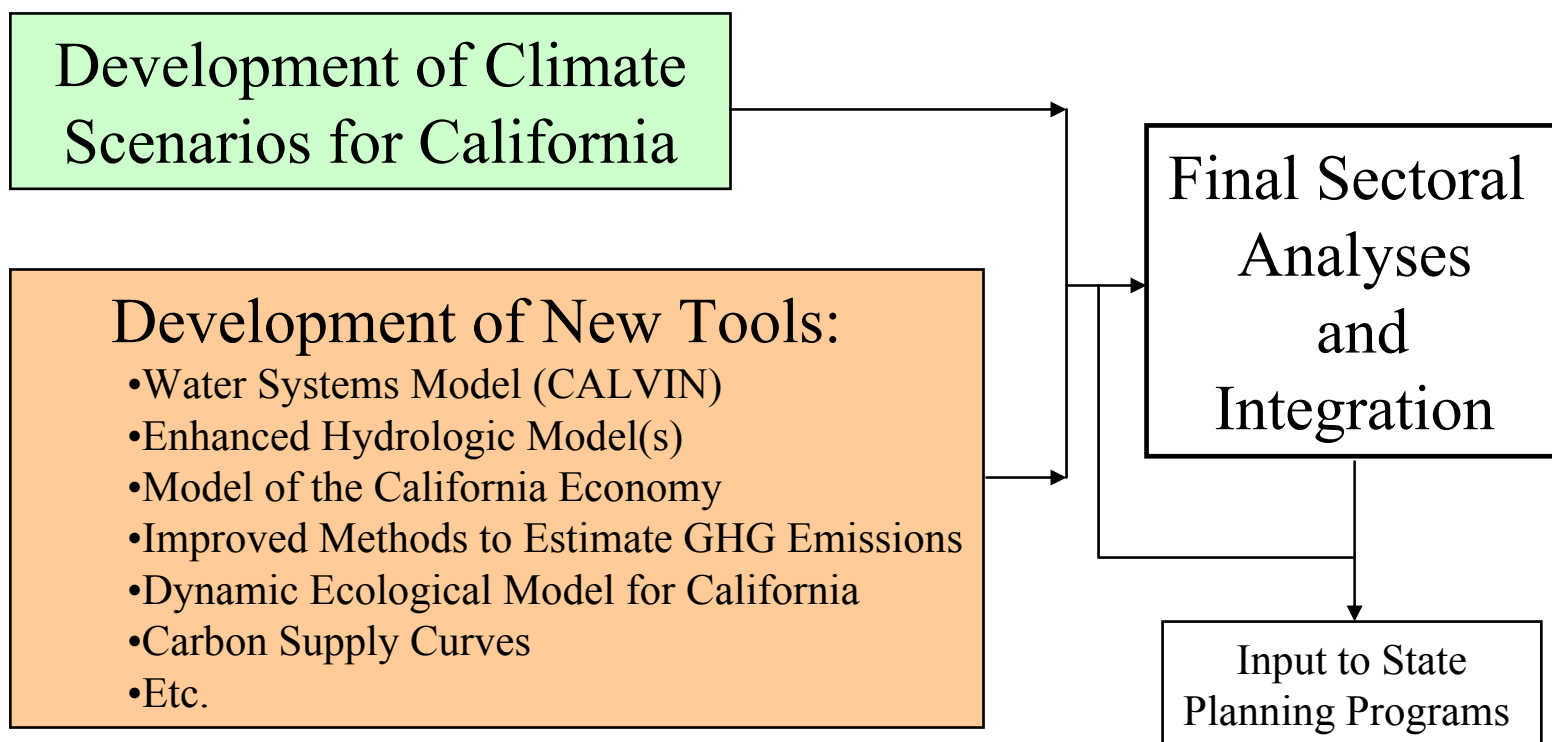
PIER Climate Change Plan

- ★ Developed and based on “roadmaps” for research prepared by technical experts. Our project with EPRI was extremely useful
- ★ About 70 experts from state agencies, national laboratories, USGCRP, NGOs, and universities assisted in the review process
- ★ Designed to complement existing national and international RD&D Programs generating policy-relevant results for California
- ★ “Living” document to be updated as needed.
- ★ Available at <http://www.energy.ca.gov/pier/reports/500-03-025fs.html>

California Climate Change (Research) Center



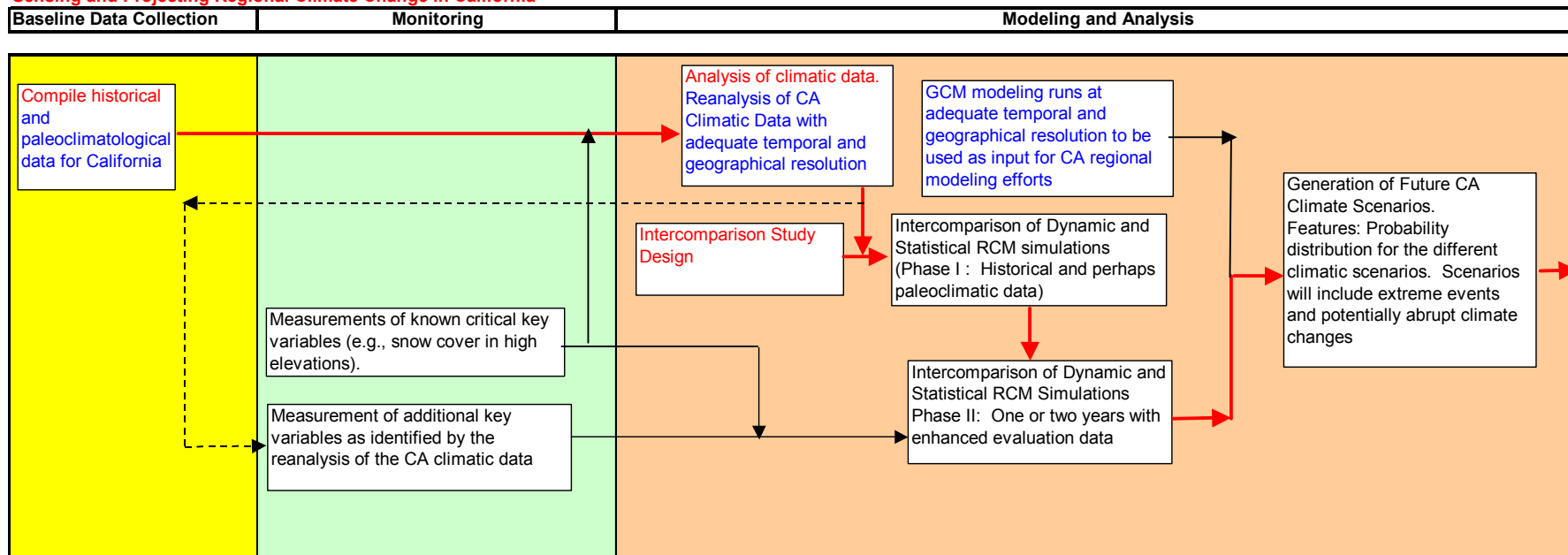
General Strategy



Every project has a Technical Advisory Committee to ensure usefulness of results for state planning activities.

PIER Research Path: an example

Sensing and Projecting Regional Climate Change in California



Red = Tier I (project in the critical path and when PIER may provide most of the funding, if needed)

Black = Tier II (PIER and outside funding)

Blue = Tier III (mostly outside funding)

— Critical Path

Economics Research in the PIER R&D Plan: Background and Overview

An Example of a Core Study Area

The California context

- ★ The PIER role is to help develop the knowledge base for policy-makers
- ★ Underlying a host of complex problems are basic policy-relevant questions:

What are the potential costs of climate impacts on our natural and economic systems?

What will it cost to deal with these impacts - through either mitigation or adaptation?

What will be the costs and benefits of programs and policies to abate GHG?

Overall, what are the economic *risks* involved, and how should they be addressed?

The state-of-the-art in the economics of climate change

- ★ Research has been going on for years or decades on the economics of both impacts/adaptation and GHG mitigation - primarily national and international levels
- ★ However, there is still *considerable* uncertainty regarding costs and benefits of various policies
- ★ On impacts side: Noteworthy that most research - particularly at sector level - has been deterministic

Climate economics, cont.

- ★ On the GHG mitigation side:

A very large body of research exists - particularly on the costs of CO₂ abatement and/or energy demand reduction

However: There remains a wide range of estimates as well as grounds for doubt regarding their robustness

Example: Energy Modeling Forum study of the Kyoto Protocol - estimates of the marginal cost to U. S. varied by a factor of *five*

Implications for California Research

- ★ Existing economic tools need to be enhanced and extended, not just taken as-is and applied to California.
- ★ Accordingly, research will focus on methodological aspects as well as applications
- ★ New research pathways involve both theoretical and empirical issues
- ★ Not all relevant issues can be addressed solely through PIER-supported research

Key policy issues

- ★ How can California formulate policies for dealing with climate impacts that are robust across a wide-range of uncertainty?
- ★ How might water and electricity supply and demand be affected by regional climate change?
- ★ What are the costs and benefits of various price and non-price policies to abate GHGs in California?
- ★ How will technological change affect the costs of GHG mitigation in California?

Initial Priority Research Areas

- ★ Integrated economic (computable general equilibrium - "CGE") modeling
- ★ Economic studies of climate change and water resources
- ★ Regional markets for GHG trading
- ★ Technological change, environmental policy, and energy trends
- ★ Urban water and energy demand
- ★ Economics of energy efficiency

Integration and coordination

- ★ Research topics are complementary
- ★ Three-fold role for CGE modeling:

Provide a practical applied policy tool

Serve as an integrating platform for other work
- e.g., water supply/demand impacts, supply
curves for GHG reduction, regional climate
projections

Provide a computational "laboratory" for
analyzing the implications of different models
of, e.g., technological change

Outcomes and Benefits

- ★ Outcomes: Substantially improved and state-of-the-art economic tools for application to policy-making
- ★ Benefits: Capability for California to make informed, economically-grounded decisions on climate change mitigation and adaptation and GHG abatement
- ★ Applications to multiple systems, sectors, and issues, including
 - Water and agriculture
 - Electricity
 - State, national and international GHG mitigation policies

Summary

- ★ First state funded long-term research program on climate change
- ★ Interdisciplinary program
- ★ Annual Conferences to share results, coordinate with other programs, and develop new ideas